

WHAT IS CLAIMED IS:

1. A display apparatus comprising:

an enclosure defining an interior, said enclosure having an aperture therein communicating between the exterior and the interior;

a screen surface generally opposing said aperture;

a viewing station configured to be occupied by a user having an eye located at an eyepoint;

a projector supported adjacent the aperture and projecting light through said aperture and against said screen surface so as to form an image thereon that is visible to the user from the eyepoint;

a mask supported so as to block light from the projector proceeding to the eyepoint of the user.

2. A display apparatus according to claim 1, wherein said mask is supported inward of the aperture between the aperture and the eyepoint, said mask being positioned so as to not obstruct projection of light that forms the image on the screen surface.

3. A display apparatus according to claim 2, wherein the mask is configured so as to completely cover any part of a last lens surface of the projector that is visible in the aperture when viewed from the eyepoint.

4. A display apparatus according to claim 3, wherein the screen surface is an inwardly facing concave surface that extends around the aperture, and

wherein the system further comprises a second projector projecting light so as to form a second image on the screen surface surrounding the aperture.

5. A display apparatus according to claim 4, wherein the mask has an inward surface facing the eyepoint, said inner surface being a projection surface of substantially the same reflective qualities as the screen surface, a portion of the second image being formed on the inward surface of the mask.

6. A display apparatus according to claim 5, wherein the inward surface of the mask is planar and parallel to the aperture.

7. A display apparatus according to claim 4, wherein the screen surface is of a spherical shape.

8. A display apparatus according to claim 3, wherein the mask is configured to cover any part of a last lens surface of the projector visible through the aperture when viewed from any point in a viewing volume around the eyepoint, said viewing volume being an estimate of a set of points to which the eye of the user can move while the user is at the viewing station.

9. A display apparatus according to claim 3, wherein the mask is supported on a support structure extending from a location adjacent the aperture to the mask, said support

structure extending behind the mask so that said support structure is not visible from the eyepoint.

10. A display apparatus according to claim 9, wherein the enclosure has therein a second aperture receiving therein an aperture fixture, said aperture fixture defining the first aperture, said support structure being supported on the aperture fixture.

11. A display apparatus according to claim 1, wherein the enclosure has a screen surface portion thereon around the aperture and facing inwardly thereof, said aperture fixture having an inward face of similar reflective qualities to the screen surface portion and flush therewith.

12. A display apparatus according to claim 11, wherein said support structure is supported on said aperture fixture.

13. A display apparatus according to claim 12, wherein said support structure is movably supported on said aperture fixture so that the position of the mask can be adjusted.

14. A display apparatus according to claim 13, wherein the support structure and the aperture fixture have a magnetic engagement with each other that allows adjusting movement of the mask.

15. A display apparatus according to claim 1, wherein the display apparatus is a simulator for a vehicle having a cockpit, and the viewing station includes a dummy cockpit assembly adapted to surround the user, the image projected by the projector being shaped so that no part of the projected light thereof strikes the cockpit assembly.

16. A display apparatus according to claim 1, wherein the projector is a scanning laser projector.

17. A display apparatus according to claim 1, wherein the image is a time-varying real-time image.

18. A display apparatus according to claim 17 wherein the image is received from an image generating computer system.

19. A display apparatus for displaying projected images to a user, said apparatus comprising:

a viewing station adapted to support the user such that an eye of the user at a point in time is at an eyepoint in a predetermined viewing volume of possible eyepoints of the user at said viewing station;

first and second projection screen portions facing the eyepoint, the first projection screen portion having therein an aperture;

said first projector projecting an image on the second projection screen portion;

a mask supported between the aperture and the viewing station, said mask being configured so that the mask covers any part of a last lens surface of the first projector viewable through the aperture from any eyepoint in the viewing volume;

said mask having a surface generally facing the second projector; and

said second projector projecting light on said first screen portion and said surface of said mask so as to form a second image thereon that is visible to the user.

20. The apparatus according to claim 19 wherein the first and second screen portions are parts of a continuous general spherical portion projection screen member.

21. The apparatus according to claim 19 wherein the second screen portion and the surface of the second mask have identical or substantially identical reflective properties.

22. The apparatus according to claim 19 wherein said images are time-varying real-time video images.

23. The apparatus according to claim 22 wherein the images are received from an image generating computer system.

24. A method of displaying an image to a user seeing from an eyepoint at a viewing station, said method comprising:

providing a projection screen portion generally facing said user, and a projector adjacent a wall structure having an aperture therein;

generating an electrical signal defining an image and transmitting said electrical signal to the projector so as to cause the projector to project light corresponding to said image through said aperture and against said projection screen portion so as to form said image thereon so as to be viewed by the user; and

blocking with a mask supported in or adjacent the projector a portion of said light that is scattered from a last lens surface of the projector and is traveling so as to strike the eyepoint of the user while permitting said light of said image to proceed without obstruction to said projection screen.

25. The method according to claim 24, wherein said blocking blocks light directed to eyepoints in a viewing volume containing said eyepoint, said viewing volume being defined by a range of possible eyepoints for said user at said viewing station.

26. The method according to claim 25, wherein said mask is positioned between the aperture and the viewing station, said mask being configured and located such that the mask occults any part of the last lens surface of the projector that is in a line of sight from any eyepoint in the viewing volume through said aperture.

27. The method according to claim 26, and further comprising placing the mask adjacent the aperture on an adjustable structure, and adjusting said mask so that the last lens surface of the projector is occulted from every eyepoint in the viewing volume.

28. The method according to claim 24, and further comprising generating said electronic signal with an image generator, said image generator transmitting a plurality of time varying images that are displayed by the projector to the user.

29. The method according to claim 26, wherein said wall structure supports a screen structure facing the user, said screen structure having said aperture extending therethrough, said method further comprising projecting a second image on said screen structure adjacent said aperture.

30. The method according to claim 29, wherein said mask has a surface facing the second projector, said second projector directing light for a portion of said second image against said surface of said mask so as to form thereon a portion of said second image.

31. The method according to claim 24, wherein said viewing station includes a cockpit structure.

32. The method according to claim 24, and further comprising
blocking with a second mask supported in or adjacent the projector a further portion of said light that is scattered from the last lens surface of the projector and is traveling so as to strike an eyepoint of a second user in said viewing station.

33. The method according to claim 32, wherein said blocking blocks light directed to eyepoints in a second viewing volume containing said eyepoint of said second user, said

second viewing volume being defined by a range of possible eyepoints for said second user at said viewing station.

34. A display apparatus according to claim 1, wherein said viewing station is configured to be occupied by a second user in addition to said first user, said second user having an eye located at a second eyepoint; and

a second mask supported so as to block light from the projector proceeding to the second eyepoint of the second user.

35. A display apparatus according to claim 34, wherein the second mask is configured to cover any part of the last lens surface of the projector visible through the aperture when viewed from any point in a second viewing volume around the second eyepoint, said second viewing volume being an estimate of a set of points to which the eye of the second user can move while the user is at the viewing station.

36. A display apparatus according to claim 35, wherein first and second masks are supported on a member projecting inward from said wall structure adjacent said aperture.

37. A display apparatus according to claim 19 wherein said viewing station is configured to be support a second user in addition to said first user, said second user having an eye located at a second eyepoint at said point in time in a predetermined second viewing volume of possible eyepoints of the second user at said viewing station; and

a second mask supported between the aperture and the viewing station, said second mask being configured so that the second mask covers any part of a last lens surface of the first projector viewable through the aperture from any eyepoint in the second viewing volume;

said second mask having a surface generally facing the second projector; and

said second projector projecting light on said first screen portion and said surfaces of said first and second masks so as to form a second image thereon that is visible to the first and second users.